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(54) Abstract Title

A mobile telephone incorporating a radio receiver in a detachable pack which ensures calls are not missed whilst listening to the radio

(57) A mobile telephone which incorporates a radio is disclosed. The radio receiver is installed in a detachable pack of the telephone. To ensure that a user of the mobile telephone does not miss a call intended for them because they are listening to music, the acoustic equipment to be used, namely, the loudspeaker and microphone or headset with earpieces are connected to the different transmission/reception or purely reception circuits by means of selector switch circuits for the selection of one or other of the pieces of equipment by the user according to circumstance or need. Consequently, an incoming call may be detected by the vibration of a vibrator with the continued diffusion of music from the radio on the loudspeakers, or by the diffusion of music being alternated by silence or by the mobile telephone being made to ring as a replacement for or as an addition to the music itself.

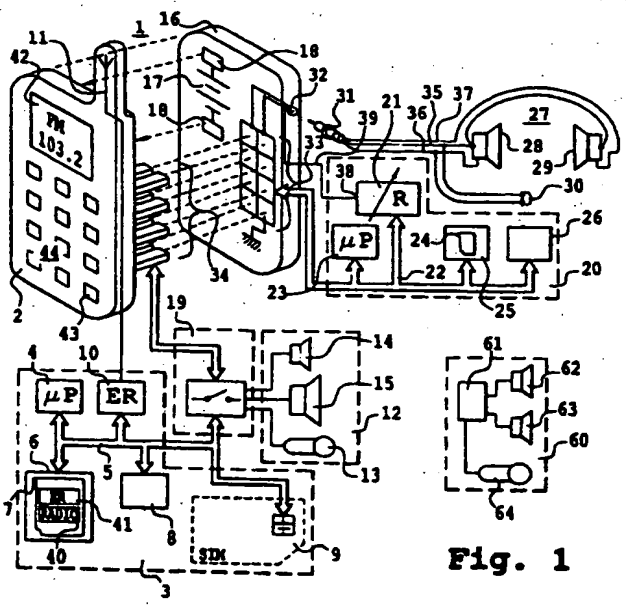

Fig. 1

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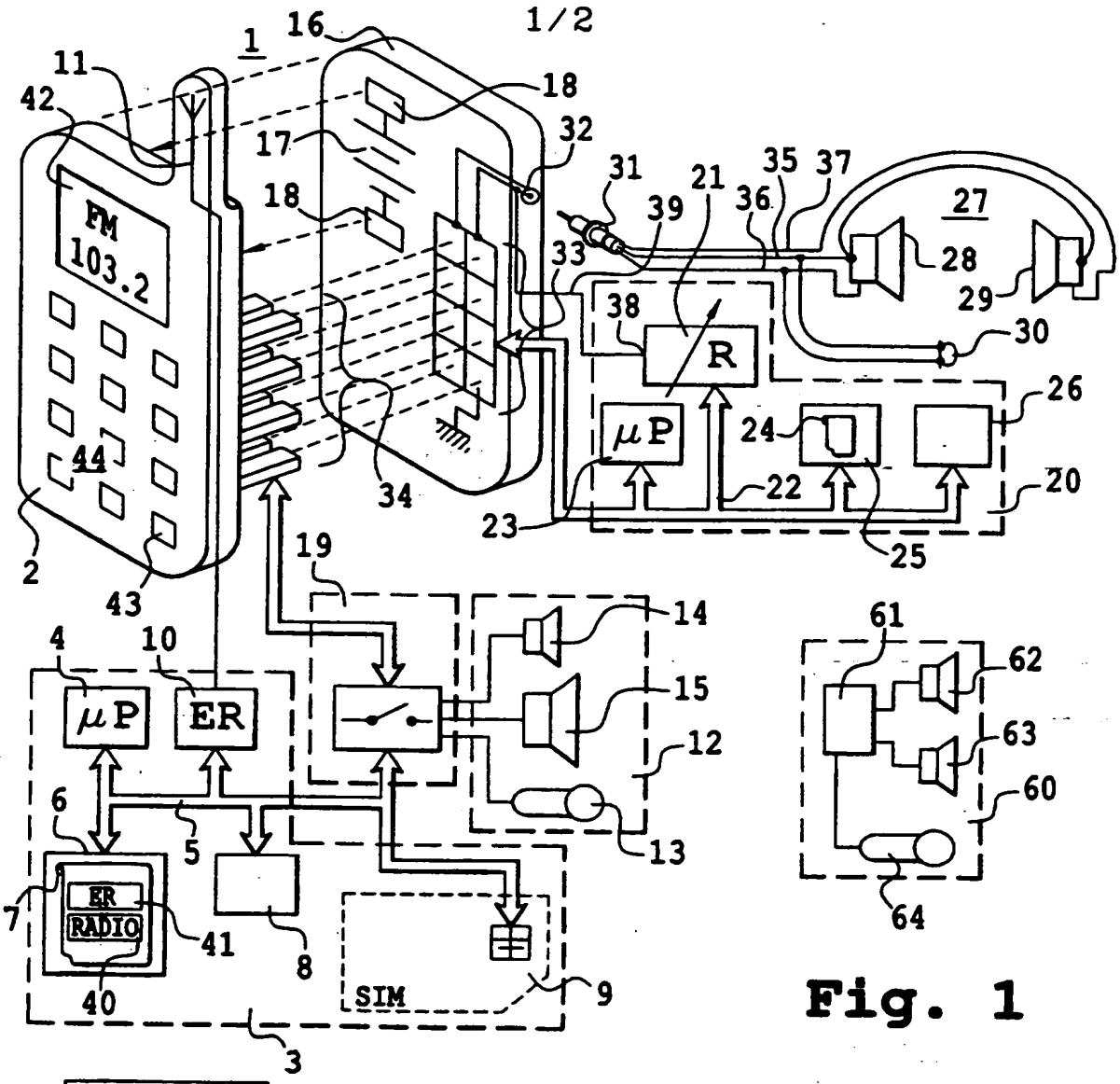
1
16
11
42
18
17
32
31
21
35
37
27
18
39
36
33
28
29
38
30
R
26
μP
24
22
20
34
23
25
19
2
43
14
4
10
61
62
μP
ER
15
63
12
6
5
60
13
7
ER
RADIO
41
8
64
40
SIM
9
3

Fig. 1

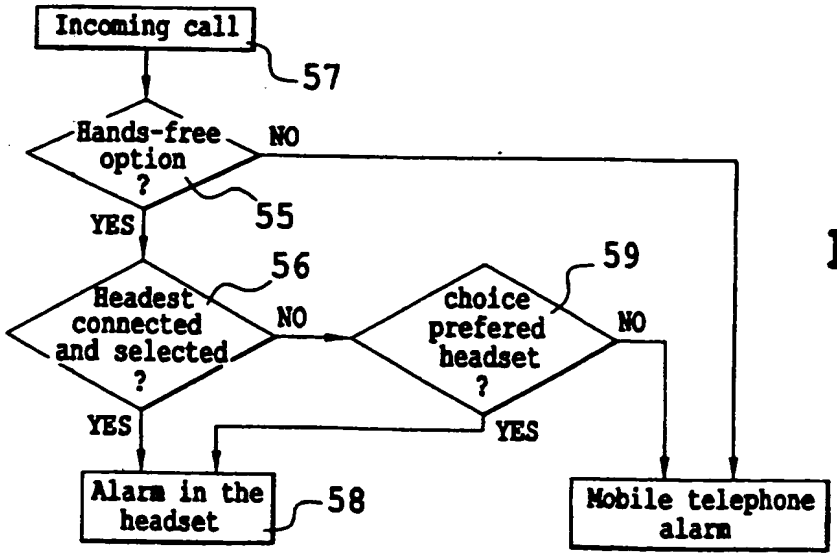
Incoming call
57
Hands-free option ?
NO
55
YES
56
Headest connected and selected ?
NO
59
choice prefered headset ?
NO
YES
YES
Alarm in the headset
58
Mobile telephone alarm

Fig. 3

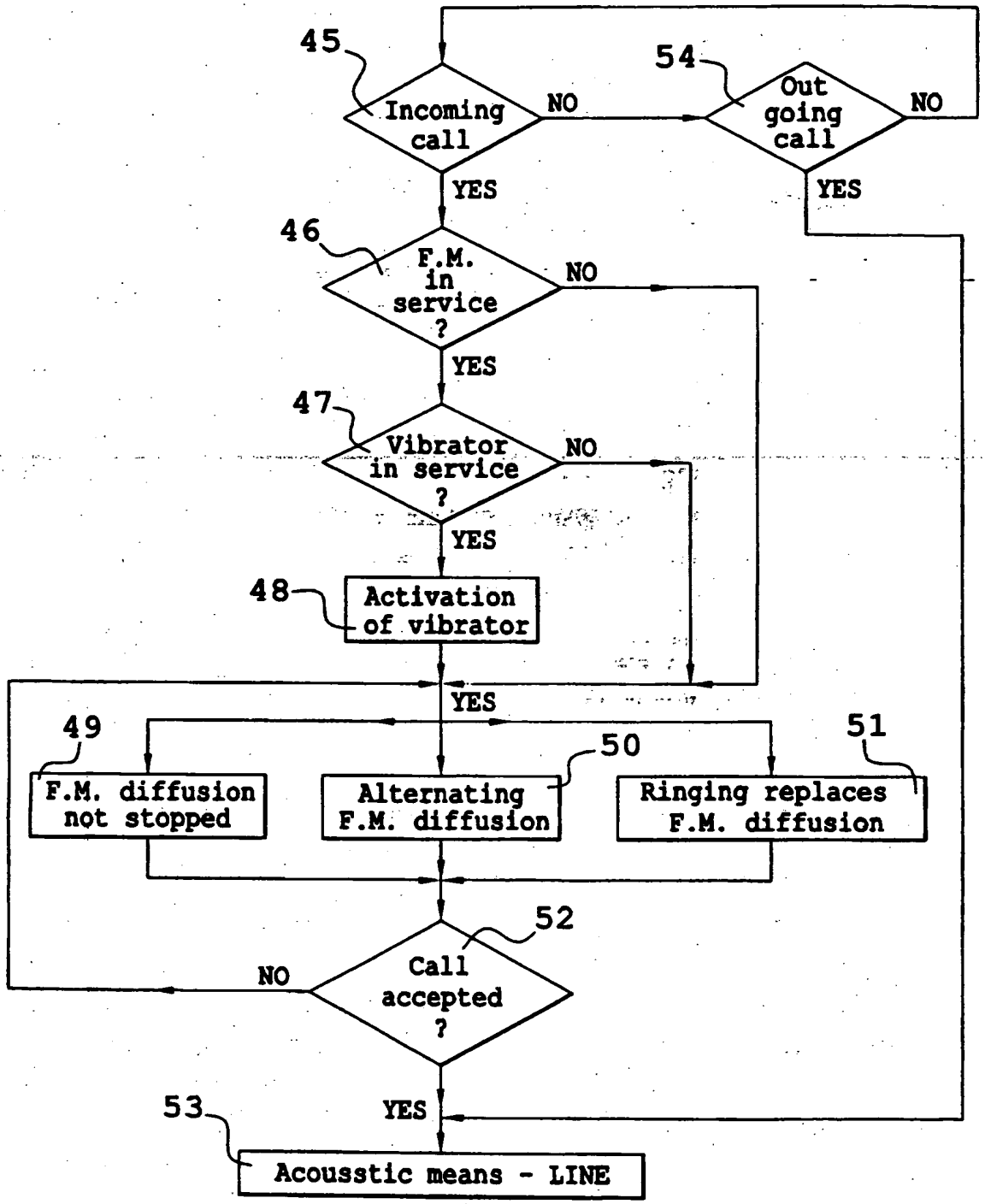
45
Incoming call
NO
54
Out going call
NO
YES
YES
46
F.M. in service ?
NO
YES
47
Vibrator in service ?
NO
YES
48
Activation of vibrator
YES
49
F.M. diffusion not stopped
50
Alternating F.M. diffusion
51
Ringing replaces F.M. diffusion
52
Call accepted ?
NO
YES
53
Acousstic means - LINE

Fig. 2

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IMPROVED MOBILE TELEPHONE

An object of the present invention is an improved mobile telephone that seeks to make it easier for subscribers to use the various pieces of electronic equipment placed at their disposal.

In mobile telephony, it has been sought to add various functions to mobile telephones in order to meet the need that a user might have for various accessories. For example, mobile telephones now have a directory function in which telephone numbers of a person's usual correspondents can be memorized. When it is not possible to store addresses or other more complex information about these correspondents, these mobile telephones have the advantage of being able to obtain an automatic dialing of a telephone number from this directory. Furthermore, there is also a known calculator function that also makes it necessary to plan for bigger mobile telephone screens as well as to review the ergonomic value of the control button of a mobile telephone touch pad. Furthermore, a mobile telephone is now capable of telling the time and of being used as a diary. In improved machines, the memory can even be used to constitute a pocketbook function.

There is another function that has not yet been implemented. This is the function of radio reception. Indeed, customers, especially young customers, often need to listen to music. In the prior art, a second piece of equipment, a portable radio, is needed for this purpose. In the invention this problem is resolved by incorporating the radio device into the mobile telephone.

Other problems then arise, especially a problem of cost and a problem of ergonomy of use. To resolve this problem of cost in the invention it is provided that certain types of equipment will be shared. For example, the battery power supply will be used both for the radio receiver and for the mobile telephone itself. However, given a mode of radiophonic use that is different from a mode of use of a mobile telephone, certain specific pieces of equipment have to be kept. Thus, a mobile telephone must be provided with loudspeakers and microphones that are accurately positioned so that telephone communication is possible when the mobile telephone is held close to the user's ear. However, in radiophonic use, naturally another piece

of equipment, for example a headset with earpieces, is connected by a movable connector, a jack, in the receiver.

In the invention, the problem that results from these cases of duplication of equipment is resolved by providing that the acoustic equipment to be used, namely the loudspeaker and microphone or headset with earpieces (and possibly also a microphone) will be connected to the different transmission/reception or purely reception circuits by means of selector switch circuits for the selection of one or other of the pieces of equipment by the user according to need or, better still, according to circumstance. It will be shown that, by acting in this way, there is no likelihood of the user of a mobile telephone not hearing a telephone call intended for him because he is, for example, listening to music.

Furthermore, to simplify the manufacturing process while allowing for the possibility of listening to music with a mobile telephone as an additional option attached to a device of this kind, the radio receiver will preferably be installed in a detachable pack of the mobile telephone.

An object of the invention therefore is a mobile telephone comprising a first pack provided with first radioelectric transmitter/receiver circuits to process first electrical signals and provided with second acoustic transmission and reception circuits to process second acoustic signals corresponding to the first electrical signals, wherein the telephone comprises third radioelectric receiver circuits producing third electric signals and a selection switch circuit connected to the first, second and third circuits to diffuse second acoustic signals corresponding to the first or to the third electric signals.

The invention will be understood more clearly from the following description and the appended figures. These figures are given purely by way of an indication and in no way restrict the scope of the invention. Of these figures:

- Figure 1 is a schematic view of a mobile telephone according to the invention;

- Figure 2 is a program implemented in the mobile telephone of the invention to enable an improved ergonomy of the available acoustic means;

- Figure 3 is an improvement of the program of Figure 2 in the case of an incoming call.

Figure 1 shows a mobile telephone 1 according to the invention. The telephone 1 has a first pack 2 provided with first radioelectric transmitter/receiver circuits 3. The circuit 3 in a known way has a microprocessor 4 connected by a bus 5 to a program memory 6 comprising a program 7. The microprocessor 4 is also connected to a data memory 8 and to a SIM (subscriber identification module) card 9. The radioelectric transmitter/receiver circuits 3 essentially comprise radioelectric transmission/reception circuits 10 connected to the bus 5 and to an antenna 11. The working of these transmitter/receiver circuits 3 is known. In particular, depending on security data contained in the circuit 9 and in the memory 8, the microprocessor 4, applying the program 7, may parameterize the circuits 10 to effect the transmission or reception by the antenna 11 of the radioelectric signals and the conversion of these radioelectric signals into electrical signals conveyed by the bus 5 or vice versa.

The mobile telephone 1 furthermore comprises second acoustic transmission and reception circuits 12, herein schematically represented by a microphone 13, an earpiece 14 and a hands-free loudspeaker 15. In practice, the circuits 12 comprise at least digital-analog converters or analog-digital converters to convert the electrical signals conveyed by the bus 5 into analog signals that are acoustically broadcast by the loudspeakers 14 and 15, and reciprocally to convert the analog signals produced by the microphone 13 into digital signals. In most cases, the loudspeaker 15 is made quite simply with the loudspeaker 14 but in feeding this loudspeaker 14 with a more powerful electrical signal.

The mobile telephone 1 also comprises a removable pack 16. In most cases, the pack 16 will be a battery pack. However, it could be otherwise. The pack 16 in this case has a battery 17 connected by pins such as 18 to the circuits of the pack 2 to supply them with electrical power.

In the invention, this set of packs 2 and 16 or the pack 2 alone comprises a selection switch circuit 19 and third radioelectric receiver circuits 20 that produce third electrical signals. The selection switch circuit 19 is connected to the first circuits 3 and to the second circuits 12 and third circuits 20 to enable the broadcasting of the acoustic signals corresponding to the first or third electrical signals. In practice, in a simplified version, this piece of equipment enables the broadcasting, to the acoustic signal broadcasting

loudspeakers 14 and 15, of the sounds corresponding to electrical signals produced by the circuit 20 or by the circuits 3. In the version shown, in order to make the installation of the radio receiver 20 optional, this receiver will be installed in the removable pack 16.

In one exemplary embodiment, the third radioelectric receiver circuits 20 essentially comprise a frequency tunable receiver 21, that is tunable particularly in the 87.5 MHz to 108 MHz range corresponding to public radio broadcasts. This receiver 21 is controlled by means of a bus 22, for example by a microprocessor 23 implementing a program 24 contained in a program memory 25. The memory 25 and the microprocessor 23 are furthermore connected to a data memory 26. The circuits 20 are, in this respect, standard circuits. Since the data memory 26 is programmable and erasable by the user, it can comprise parameters for the presetting of the receiver circuit 21, especially corresponding to preferred radio broadcasting channels.

The bus 22 is a bus that is both digital to control the receiver 21 and analog to convey the electrical signals corresponding to sounds to be diffused that have been demodulated by the receiver 21. Preferably, to this end, the receiver 21 will comprise a decoder to decode convenience signals. For example, these convenience signals could be RDS type signals associating information, especially on the name of the radio channel., with the sounds diffused. There are also known ways of displaying information corresponding to these convenience signals on the screen which, in the invention, would be a mobile telephone screen. However, these convenience signals may be simply indications of a demodulated frequency at which the receiver 21 is set and may furthermore be computed by the receiver circuit 21 itself unless they have been decoded. To this end, a screen 42 of the telephone 1 gives an FM indication that a radiophonic use is in progress and that the set frequency is 103.2 MHz.

Preferably, the equipment 2, 16 will be complemented by a removable headset 27 provided with earpieces 28 and 29 preferably provided with a microphone 30. The headset 27 is connected especially by a jack type removable plug 31 to a corresponding connector 32 made in the pack 16. The connector 32 and the bus 22 reach metal zones 33 positioned in the removable pack 16. These metal zones 33 correspond to complementary pins 34 which are preferably slightly retractable and furthermore connected,

for example by means of the selection switch circuit 19, to the bus 5. As a variant, the jack 32 may be placed in the pack 2. However, this approach may be less propitious to then presentation of the circuits 20 as a business option.

On the whole, the selection switch circuit 19 is used to put the circuit 3 in communication with the acoustic circuits 12 or the helmet 27 or else to enable the radio reception circuit 20 to be linked with the headset 27 or the acoustic circuits 12. In the latter case, it may be planned to make this embodiment in two ways. Either the circuit 19 is divided partly into the pack 2 and partly into the pack 16 or the electrical signals conveyed by three connections 35, 36, 37 connected to the jack 31 and to the acoustic elements of the helmet are conveyed by connectors 33 and 34 to the selection switch circuit 19 before being redistributed, especially by other conductive zones and conductive pins of these connectors 33 and 34, to the corresponding acoustic circuits.

According to one particular independent feature of the invention, a headset 27 has been designed with listening devices 28, 29 and a special microphone 30. This microphone may be, for example, a bone conduction microphone that measures the sounds uttered through resonance on the skull. This headset can even be used when there is no radio reception circuit 20. It will quite simply be enough to place the plug 32 in the body 2 of the telephone 1. Indeed, in the invention, this headset 27 is made with only three connections. A first connection 35 that can be likened to a ground connection is used as the reference connection for each of the loudspeakers 28, 29 as well as for the microphone 30. The electrical signals convertible into acoustic signals by the loudspeakers 28, 29 are respectively conveyed by the connections 36 and 37. The microphone 30 has a second terminal also connected to the connection 36. The loudspeakers have a low impedance of about 32 ohms and the microphone 30 is not affected by the presence of electrical signals at the connection 36.

By contrast, in order to enable the microphone 30 to be used, the connection 36 will be biased at a voltage of 2 volts. This has the effect of shifting the diaphragm of the loudspeaker 28. This loudspeaker will therefore not be placed in its optimum state of mechanical equilibrium. However, experience shows that, with a loudspeaker 28 of this kind, the

listening quality remains quite acceptable. But again, during the use of the microphone 30, the small signals sent by this microphone resulting from the high impedance of the microphone 30 do not excite the loudspeaker 28. As a result, no Larsen effect or inconvenient noise can result therefrom.

The advantage of this approach naturally is that there is a commercially available piece of equipment, a three-connection jack , with two earpieces 28 and 29 and that the conversion is minimal. It is enough to connect the microphone 30 between two strands 35 and 36. For example, this microphone make take the form of a small pack that hangs behind the user's ear and towards the front of his neck by means of the two connections 36 and 35 themselves or, better still, it may be a bone conduction type of microphone beneath the headset. In this type of use, preferably one of the connections 35, 36 or 37 will be serve as an antenna for the receiver 21. Consequently, the signal input 38 of the receiver 21 will be connected by a connection 39, in the plug 32, to one of the connections corresponding to the connections 35 to 37.

The receiver 21 is preferably adjustable. To this end, it is possible to adjust it with a microprocessor 23 and the program 24. However, this microprocessor and program may be replaced by a subprogram RADIO 40 contained in the program 7, as a complement to a general transmission/reception program ER 41 with the mobile telephone implemented by the microprocessor 4. If we then choose the subprogram 40 which normally corresponds to the display of an appropriate menu on a screen 42 of the mobile telephone, it is possible with the control buttons 43 of the keyboard 44 of the mobile telephone to modify the reception setting frequency of the receiver 21. For example, brief pressure on an arrow key of the keypad 44 will prompt a frequency shift of 50 KHz (or -50 KHz for another arrow) whereas longer pressure on one of these arrows will prompt an automatic search.

In the preferred embodiment, the pack 16 will have two printed circuits, generally parallel to each other and to the mutually opposing faces of the pack 16 and the pack 2. The elements of the battery 17 are naturally placed between these two printed circuits, connections between these two printed circuits being made on their edges, especially so that the zones 18 are present at the interface between the two packs 2 and 16. In the

invention, the circuit 20 is then preferably placed between these two printed circuits. Preferably also these two printed circuits will be used as shielding elements. Each of them for example will be of the double face type and will have a metal layer on one of their faces. Thus, a Faraday cage is formed. This Faraday cage in particular will prevent a clock (not shown) of the circuits 3, that works in a standard way at 13 MHz, from interfering, through its harmonics and parasites, with the proper operation of these circuits 20. From this viewpoint, the fact of placing the radio receiver in a removable battery pack 16 is particular valuable because the shielding therein is more easily made.

Figure 2 shows the working of the mobile telephone of the invention when concurrent uses arise. The problem to be resolved especially is that of listening to the music produced by the receiver 20 when the circuits 3 detect an incoming call. All the programs concerned are implemented by the microprocessor 4 or by the microprocessor 23.

Thus, during a test 45, an incoming call of this kind can be detected. The test 45 comprises a number of protocol operations, especially defined by standards, especially the GSM standard. When an incoming call is detected, it is possible in one example to perform another test 46 to find out if the circuit 20 is in operation. If the circuit 20 is in operation, it will be sought to find out if the vibrator, which is also available in the mobile telephone (not shown), is itself in operation. If a vibrator of this kind is in operation at the end of the test 47, the vibrator will be activated (48).

This activation 48 of the vibrator could be followed or replaced or complemented by various alarm modes. In a first variant 49, the diffusion of music on the loudspeakers 14 and 15 or 28 and 29 will not be stopped. In this case, the call can be detected only through the recognition by the user of the vibration given by the vibrator. Or else, in a variant 50, the diffusion of the music will itself be chopped, for example with a repeated one-second stop for every two seconds of music sent, and this will be done for example for 30 seconds. In this case, through the alternating diffusion of the music, the user will perceive that he is actually receiving a call. Or else again, quite simply, in one variant 51, the mobile telephone will be made to ring as a replacement for or as an addition to the music itself.

Subsequently, during a test 52, it is sought to find out if the user is accepting the call or not. If he accepts the call, the acoustic means, namely the microphone 9 and the loudspeakers 14 and 15 or the microphone 30 and the loudspeakers 28 and 29 are placed at the disposal of the line in a step 53. Otherwise, the options 49 to 51 are kept, preferably for a limited duration beyond which the mode of operation of the mobile telephone, especially in music diffusion mode, is restored as it was before the reception of the call. In this case, for the calling party, it is as if the user has not taken the call. The call is either rejected or sent towards a voice message system by the services of the mobile telephony operator.

When it is an outgoing call, a test 54 detects the take-over of control by the user who presses a key corresponding to the outgoing call. In this case, the acoustic means available for the line are made available by direct action.

Figure 3 gives a view, especially in the case of an incoming call, of how the acoustic means are made available by the selection switch circuit 19.

To this end, it has been shown that the selection switch circuit 19 is connected to the bus 5. This connection makes it possible to transmit the selection switch commands to the circuit 19 and, at the same time, the routing commands of the different electrical signals. This connection is also used to transmit the electrical signals themselves.

According to a parameterizing operation, especially in the memory 8, a test 55 is conducted to find out if the telephone is being used in hands-free mode or not. When it is being used in hands-free mode, it means that the diffusion of the sound is oriented either towards the loudspeaker 15 (and not towards the loudspeaker 14) or towards the loudspeakers 28 and 29. This second possibility is measured during a subsequent (or prior) test 56 to find out firstly if the plug 31 is connected to the connector 32 and secondly if the use parameters stored in the memory 8 have detected a preselection chosen by the user. The connection test for the headset 27 can be done especially by a jack connector which, when a jack is not inserted, connects at least two connections together. The preselection is deduced from the contents of the memory 8.

If this is the case, then at the time of an incoming call 57, a alarm 58 is prompted in the headset 27. The alarm 58 may take the form of the mode 50 or the mode 51 or even the mode 49.

If the headset 27 is connected but not selected, it means that the sound is being diffused by the loudspeaker 15. In this case, during a test 59, it may be sought to find out if, in the different use parameters of the telephone 1, the user does not prefer, for an incoming call, to receive an alarm indicating the presence of the incoming call in the earpieces 28, 29 of the headset 27 (according to the modes 50 and 51). If necessary, the alarm is nevertheless transmitted by the headset 27 although the music is heard in the earpiece 15.

If the hands-free option 55 is not selected or if the preferred choice 59 is not preset, then the alarm indicating the incoming call is diffused in the acoustic means of the mobile telephone, namely especially with the loudspeaker 15.

However, it has been noted that certain uses related to this duality of acoustic means could be irksome to the user. Indeed, preferably in the invention, when the user rejects a call or more generally when he cuts a telephone conversation short, it is provided that if a hands-free mode using the loudspeaker 15 is preselected, this preselection will be replaced by diffusion on the loudspeakers 28 and 29 of the headphones 27. Indeed if, at the time of the telephone call, the user uses his mobile telephone by wearing it close to his ear, namely by using in practice a loudspeaker 14, namely the one that is less powerful, the fact of cutting off the conversation may prompt an automatic setting up of a previous hands-free mode with the loudspeaker 15. This will then lead to a very painful deafening for the listener who will continue to have the mobile telephone carried close to his ear. In this case, it is planned that, during this end-of-call switching, even if the loudspeaker 15 is preselected, the diffusion by the selection switch circuits 20 will be oriented towards the loudspeakers 28 and 29. All these switching operations can easily be managed by the circuit 19 controlled by the microprocessor 4.

In one variant shown in Figure 1, the acoustic diffusion means comprise a hands-free kit 60. A hands-free kit 60 of this kind is designed for example to replace the hands-free loudspeaker 15 when the user of the telephone 1 is in a particular place, mainly in his car. With a hands-free kit

60 of this kind, the detection of the fact that the telephone 1 is in this particular place is achieved generally by the connection of this telephone 1 to a communications panel. The communications panel, which is not shown ,is furthermore linked with the telephone 1 and with the circuits of the kit 60. As a variant, the link of the telephone 1 to the kit 60 may be radioelectric. When the panel exists, it may furthermore be used to recharge the battery of the mobile telephone 1. In any case, the kit 60 has an interface 61 for exchange with the telephone 1. The interface 61, in a standard way, is also connected to loudspeakers 62 and 63 of the particular place in which it is located and also, for example, to a microphone 64. In one example, the loudspeakers 62 and 63 are stereophonic and are placed in boxes in the door of the car.

In the invention, profitable use has been made of a hands-free kit 60 such as this to diffuse the signals received in the receiver 21 through the loudspeakers 62 and 63 by means of the interface 61. In practice, since the kit 61 easily replaces the loudspeaker 15, a known type of management proper to this kit 60 can be used to make this kit broadcast the transmissions received by the receiver 21, especially those of the invention which come from the receiver 21. For example if the hands-free kit option is activated, all the signals to be diffused by the loudspeaker 15 are transmitted to the kit 60 so that it diffuses them. Thus, in the ergonomy of use of radiophonic diffusion simultaneously with telephonic diffusion, it suffices to plan either to replace the loudspeaker 15 by the kit 60 or to have another function of the same type as the functions 49 to 51 but one that makes profitable use of the existence of this hands-free kit 60.

By acting in this way, the battery of the mobile telephone 1 is not discharged by the radiophonic use. Furthermore, a radio listening mode of this kind helps reduce car radio thefts since, in carrying his mobile telephone, the user also carries his radio.

In the invention, it has also been discovered that the reception and demodulation of radiophonic radioelectric transmissions received by the circuit disturbs the working of the mobile telephone and that, furthermore, a background noise is perceived in the loudspeaker. In particular, it has been discovered that these disturbances are transmitted by the electrical power supply circuit of the mobile telephone, especially by the lengthy connections between the circuits 3 and 20 and the battery 17. To avert the effects of

these disturbances, the idea has arisen of connecting the first connection 35 of the three-strand cable to a ground connection of the power supply of the mobile telephone 1 (and more generally the electrical supply connections of the mobile telephone 1) by means of plug circuits. These plug circuits define very high impedance values for alternating electrical signals contained in the commercial radioelectric band, typical the 80 to 120 MHz band, and the GSM bands, as well as the long-wave band, around 100 KHz. These plug circuits, which are lowpass type circuits, thus prevent the presence of background noise in the loudspeakers 28 and 29 or 14-15.

WHAT IS CLAIMED IS :

1. A mobile telephone comprising a first pack provided with first radioelectric transmitter/receiver circuits to process first electrical signals and provided with second acoustic transmission and reception circuits to process second acoustic signals corresponding to the first electrical signals, wherein the telephone comprises third radioelectric receiver circuits producing third electric signals and a selection switch circuit connected to the first, second and third circuits to diffuse second acoustic signals corresponding to the first or to the third electric signals.

2. A telephone according to claim 1, comprising a headset, microphone and loudspeaker connected by a three-connection cable and by a removable pin to the first and second circuits, a first connection of the cable being connected in common to a first terminal of a first loudspeaker, to a first terminal of a second loudspeaker and to a first terminal of a microphone, a second connection being connected to a second terminal of the first loudspeaker and to a second terminal of the microphone and the third connection being connected to a second terminal of the second loudspeaker.

3. A telephone according to one of the claims 1 to 2, comprising in the third reception circuits, a decoder of accompanying signals and a circuit for the transmission of these accompanying signals to a first pack and, in this first pack, means for the display of indications corresponding to these signals on a screen of the mobile telephone.

4. A telephone according to one of the claims 1 to 3, comprising third radioelectric receiver circuits producing third electrical signals, the first circuits comprising circuits to modify a configuration of a selection switch circuit at the time of the reception of an incoming telephone call or at the time of the transmission of an outgoing telephone call.

5. A telephone according to one of the claims 1 to 4, comprising a removable battery pack provided with third radioelectric receiver circuits producing third electrical signals.

6. A telephone according to one of the claims 1 to 5, wherein a radioelectric antenna of the third circuits is formed by the connection cable of the headset, this connection cable of the headset being connected to a

signal input of a radioelectric receiver of the third radioelectric reception circuit.

7. A telephone according to one of the claims 1 to 6, comprising in a first pack, circuits to set the third receiver circuits contained in a second pack ,which is preferably removable.

8. A telephone according to one of the claims 1 to 7, comprising at an interface between the first pack and the second pack, two complementary connectors dedicated to these third circuits.

9. A telephone according to one of the claims 1 to 8, wherein the second pack comprises two printed circuits holding together battery elements and the third circuits, these printed circuits being shielded to protect these third circuits from radioelectric noises produced by the first pack.

10. A telephone according to one of the claims 1 to 9, comprising a hands-free kit connected to the third circuits, preferably by a panel for recharging the battery of this mobile telephone.

11. A telephone according to one of the claims 1 to 10, wherein a connection of the three-connection cable is connected to a ground connection of the mobile telephone by a plug circuit.

12. A telephone according to one of the claims 1 to 11, comprising means to choose a configuration of a management of incoming calls, these means allow to use the second and third circuits.

13. A telephone according to claim 12, comprising means to parameterize the configuration.

14. A telephone according to claim 13, wherein the means allow to select hands-free option, handset option or a normal mode of use of the mobile telephone.

15. A telephone according to one of the claims 1 to 14, comprising means to warn the user of an incoming call.

16. A telephone according to claim 15, comprising means to produce a vibration.

17. A telephone according to claim 15, comprising means to stop a radiophonic diffusion.

18. A telephone according to claim 15, comprising means to make an alternating radiophonic diffusion.

19. A telephone according to claim 15, comprising means to request

a ring of the mobile telephone as a replacement for or as an addition to the music itself.

20. A telephone according to one of the claims 12 to 19, comprising a data memory (8) to store the parameters of the management of incoming calls.

21. A telephone substantially as hereinbefore described with reference to figures 1 and 2 of the drawings.

22. A telephone substantially as hereinbefore described with reference to figures 1 and 3 of the drawings.

The Patent Office

INVESTOR IN PEOPLE

15

Application No: GB 0016268.5 **Examiner:** Hannah Sylvester
Claims searched: 1-20 **Date of search:** 21 October 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): H4L (LDA, LECY, LERX, LESF, LEUF), H3Q (QAX), H4J (JK, JL), H4K (KOX).

Int Cl (Ed.7): H04B 1/20, 1/38, 1/40, H04M 1/00, 1/21, 1/60, 11/00, H04R 1/10.

Other: Online: WPI EPODOC JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB2336502A	(MARRAKECH) see whole document	At least: 1,2,15,17 and 19.
X	GB2329773A	(E LEAD) see particularly figure 3 and whole document	At least: 1
X	GB2308775A	(NEC) see figure 2 and whole document	At least: 1,15 and 17

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.